What Is the Potential Predictability of Seasonal Floods and Droughts?

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The question posed by the title of this presentation cannot be answered simply. The potential predictability of seasonal *anomalies* in continental hydrology (of which floods and droughts are but extreme examples) may be thought of as the upper bound in forecast accuracy to be expected when the state of the oceans is known "perfectly". Potential predictability may be inferred from analysis of an ensemble of integrations of a coupled atmosphere-land surface model in which the ocean boundary conditions are the same, but the initial conditions of atmosphere and land are different.

We estimate the potential predictability of seasonal anomalies in continental precipitation and soil moisture from an ensemble of 6 decadal integrations of the ECMWF global atmospheric model coupled to the land-surface scheme of Blondin and Böttger (1987). The same observed (AMIP) ocean boundary conditions are specified in each simulation, while the initial conditions of atmosphere and land surface vary. We assume that the potential predictability of the seasonal hydrological variables is related to their degree of reproducibility (absence of initial-condition sensitivity) across the 6 simulations.

We show that an assessment of the reproducibility of continental hydrological variables depends partly on the statistical measures of similarity that are employed. For example, intraensemble temporal correlations of like variables indicates that, on average, only about half the variance of one realization can be explained by another--and then only in equatorial regions. However, if instead the reproducibility is defined as the ratio of the interannual variance of the ensemble mean to the intraensemble variance, a more optimistic view of the potential predictability of continental hydrology emerges--at least for certain extratropical regions and seasons. Moreover, global *pattern* correlations of like hydrological variables in the ensemble suggest that the potential predictability of these variables is substantialy enhanced in the aftermath of Tropical Pacific ENSO events.

We conclude that skillful dynamical prediction of floods and droughts is more likely in the Tropics, but is possible under some circumstances in the extratropics as well. To be successful in the latter task, the forecaster must generate sufficient realizations to yield a good estimate of the ensemble-mean state and must take account of time of year and the presence of antecedent ENSO events.

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